# Burden and Drivers of HIV Infection among High-Risk Fisherfolk Populations along the Shores of Lake Victoria

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## Abstract

**Background:** Human Immunodeficiency Virus and Acquired Immunodeficiency Syndrome (HIV/AIDS) remain major public health challenges globally, contributing substantially to morbidity and mortality. The disease ranks sixth among the leading causes of illness and death in developing countries and third in Kenya. The burden of HIV/AIDS remains relatively high among high-risk groups, such as fisherfolk. This study aimed to determine the epidemiology of HIV/AIDS among the fishing community along the shores of Lake Victoria.

**Methodology:** This cross-sectional study enrolled 349 consenting members of the fisherfolk community, including boat crews, boat owners, fishmongers, and fish processors, along the beaches of Lake Victoria in Bondo, Siaya County, from 2023 to 2024. Blood samples were collected, and a detailed sociodemographic questionnaire was administered. HIV positivity was confirmed through polymerase chain reaction (PCR) amplification. Descriptive statistics characterised the population, while logistic regression analysis identified factors associated with HIV infection using STATA. The significance level was set at $p \leq 0.05$.

**Results:** Out of the 349 fisherfolk recruited, most, 165 (46.3%), were boat crew, and 41 (11.5%) had completed secondary education. Overall, 108 (71%) were male, and 247 (69.4%) were married. Notably, 152 (43.6%, n = 349) tested positive for HIV. In multivariate analysis, fisherfolk not living with their sexual partner (aOR 0.33; 95% CI 0.12–0.88, p = 0.029) and those on ARV (aOR 0.36; 95% CI 0.13–0.96, p < 0.045) were less likely to test positive for HIV.

**Conclusions and recommendations:** A large portion of the population in the fishing industry continues to test positive for HIV, indicating a high-risk group for infection. Living conditions and early ARV treatment are crucial in driving HIV infection rates among fisherfolk near Lake Victoria in Bonda.

***Keywords**: Burden and Drivers, HIV Infection, Fisherfolk Populations, Shores of Lake Victoria*

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## Introduction

Globally, HIV/AIDS continues to affect all areas of life, including social, economic, and mental aspects [1]. It remains a major public health issue causing illness, death, and stigma, despite increasing access to life-saving antiretroviral therapies (ART) and expanded care and support services for people living with HIV (PLHIV) [1]. High-mobility migratory groups, such as fishing communities, face a heightened risk of HIV/AIDS infection [2]. These communities are highly mobile, moving from one beach to another in search of fish and often spending extended periods away from their regular sexual partners [3]. Consequently, fisherfolk engage with women fish traders and tourists, forming casual sexual relationships known as 'fish for sex' [3, 4]. These interactions occur within a larger society of market traders, migrant workers, and tourists [3, 4]. The

overlapping roles of fisherfolk and sex workers along the shoreline of the Lake Victoria basin significantly contribute to HIV/AIDS transmission, as most sexual encounters happen amid inconsistent preventive practices, alcohol consumption, and drug abuse at landing sites [5, 6].

The prevalence of HIV/AIDS varies across regions in Kenya. It is highest in the Western areas, with Siaya ranked fourth at 9. 9.5%. The lowest rates are in the Northeastern regions, where Wajir, Garissa, Marsabit, and Madera report prevalence rates between 0. 0.1% and 0. 0.5% [2, 7]. This regional variation appears linked to local cultural practices. Areas with traditional high- risk customs, especially Nyanza, bear a disproportionate burden of HIV in the country [8]. Nyanza province, in western Kenya, is mainly inhabited by the Luo, a Nilotic-speaking group with distinct customs. Practices like polygamy, non- male circumcision, sexual cleansing, and economic activities related to fishing along Lake Victoria have been associated with sustaining HIV transmission [9, 10]. Poverty and the high HIV prevalence rate in this region contribute to ongoing transmission and household instability.

Additionally, changes in marital structures have led many individuals to engage in higher-risk behaviours, such as multiple partners, inconsistent condom use, and delaying treatment for STIs [11]. Equally, failure to use condoms during sex has increased sexual violence against married women aged 15-49, with a lifetime prevalence of 51. 9% [12]. Among serodiscordant couples, HIV- positive women who disclose their status often face abuse from partners or in- laws, accused of infidelity [13]. These issues- HIV/AIDS- related domestic conflicts, gender-based violence, widows' disinheritance, and social exclusion- often lead to migration among both men and women [14]. Women under economic pressure seek refuge along Lake Victoria's shorelines and engage in transactional sex[15]. Although driven by the need to support informal trading, this behaviour exposes them to high HIV risks. The danger is especially pronounced among migrant workers, fisherfolk, market traders, tourists, 'Men with money, ' and truck drivers, who often feel less constrained by societal norms due to their mobility [16, 17].

Since subpopulations such as truck drivers and fisherfolk serve as sinks for HIV/AIDS endemicity, there is a need for regular monitoring of HIV prevalence in these groups, evaluating the effectiveness of preventive measures, and developing control strategies aimed at eradicating HIV/AIDS by 2030, as planned by the Kenyan government [18]. This study aimed to determine the prevalence and predictors of HIV/AIDS among the fishing community along the shores of Lake Victoria, which is essential for developing effective intervention and management strategies, especially since funding for HIV/AIDS care and treatment in Kenya continues to decline.

## Methodology

### Study design and site

This cross-sectional study was undertaken from January 2023 to December 2024. The study was conducted in Bondo Sub-County, Siaya County, located in western Kenya, which has a population of 196,835 residents distributed across 51,362 households [19]. The area was chosen because of its high HIV/AIDS prevalence and local economic activities such as fishing, small-scale farming, and animal husbandry [20]. The research focused on boat docking sites, called landing sites, used for fish offloading and small-scale processing. As of 2023, there are 35 docking sites in the area, all managed by Kenya's Beach Management Unit (BMU).

### Study population

The study population included all the beach management unit (BMU) members working along the 35 docking beaches on the shore of Lake Victoria in Bondo, such as boat owners, fishermen, boat managers, boat builders, boat repairers, fish traders, fish processors, and

non-BMU members who resided or worked at the landing sites and earned their livelihoods from fishing activities, including shopkeepers and bar owners, who were consented and recruited. The study excluded fishers under 18 years old, those unable to give consent, or those who had been residing at the beaches for less than 6 months.

## Sample size determination and sampling

The sample size was calculated using the formula described by Lemeshow *et al.* [21]. With α set at 0.05, a 32% HIV prevalence in Kenya [3], and an additional 7% to account for potential incomplete data, 356 participants were enrolled. A consecutive sampling method was used to recruit accessible and consenting fisherfolk communities until the required number was reached.

## Data collection

**Baseline characteristics.** Factors linked to HIV infection in this population were collected through face-to-face interviews using structured questionnaires.

**Blood sample collection and manipulation.** Ten drops of venous blood were drawn with a lancet by a trained clinician into a capillary tube and spread onto a sterilised Whatman 903 filter card (S&S 903). The filter cards were air-dried at room temperature for at least 3 hours, forming dry blood spots (DBS). Collected blood samples (DBS) were uniquely labelled with barcodes matching their transmittal forms for each participant, then placed in re-sealable bags with desiccant sachets and humidity indicator cards. These were transported in a cooler box, along with their transmittal forms, to the National HIV Reference Laboratory, Kenya (NHRL). Samples not processed immediately were stored in a freezer at -40°C to -80°C for later testing.

**HIV Testing.** From each participant's DBS, a circular disc of 10-12 mm was punched or excised from saturated areas on the Whatman 903 filter cards, avoiding blood clots. Sample discs were placed into pre-labelled COBAS® Ampliprep/COBAS® TaqMan® HIV-1 Qual Test Roche Diagnostics S-TUBE, then eluted with 1100 µL of SPEX reagent and incubated in an Eppendorf ThermoMixer Comfort at 56°C and 1000 rpm with continuous shaking for 10 minutes [18]. Using COBA Amplilink software version 3.3, DBS samples were processed according to the manufacturer's instructions. After viral RNA extraction, the RNA was automatically transferred for amplification and detection in COBAS® TaqMan®, where cDNA amplification was performed automatically. Upon completion of the COBAS TaqMan® analyser, flag messages were evaluated. If the results were positive or inconclusive, the run was repeated; otherwise, the results were considered final. The repeated analyses were evaluated after each run and repeated if necessary. This process was conducted using the Early Infant Diagnostic (EID) national algorithm [22].

## Data validity & reliability

To ensure data validity and reliability, research assistants were trained using structured, English-language questionnaires, which they practised and standardised through guided simulations. The tools were then pre-tested among a small group of fisherfolk at Dunga Beach in Kisumu. Completed questionnaires were reviewed daily by the researcher for completeness and accuracy.

## Data analysis

Participants' baseline characteristics were summarised using descriptive statistics. Chi-square tests and logistic regression identified factors associated with HIV infection. These variables were selected based on their biological plausibility and clinical relevance, with results reported at 95% confidence intervals. Factors significantly associated with HIV infection at $p < 0.10$ were included in bivariate regression analysis. Additionally, significant factors from the bivariate analysis were incorporated into a multivariate regression to calculate the adjusted odds ratio (aOR) for HIV prevalence at $p < 0.05$.

All analyses were performed using R Software version 4.1.2 (2021-11-01, www.r-project.org).

## Ethical considerations

Ethical approval was obtained from the Kenyatta National Hospital/University of Nairobi Ethics and Research Committee (KNH/UON-ERC-P122/03/2024). Additional permissions were secured from the Ministry of Health, Siaya County, and the board of Kenya Fisheries. Written informed consent was also obtained from the study participants.

## Results

The average age was 32.2 years (±11.3), with a median age of 29 years ([IQR] 25-37). Most participants were male, 260 (73%), had a primary level of education, 250 (70.2%), and were single, 244 (68.5%). Among them, 165 (46.3%) were boat crews. (Table 1).

## Prevalence of HIV infection

Among the 349 participants whose blood samples were analysed, 152 (43.6%) tested positive for HIV. This included 108 (30.9%) men and 44 (12.6%) women. The majority of HIV-positive individuals, 45.4% of men and 47.7% of women, were aged 29 to 47 years ($P$ = 0.962). The majority of the men and women were single ($p < 0.1$); 48.1% of men and 54.5% of women did not use a condom during their recent sexual encounter ($p = 0.134$). Additionally, 50.9% of men and 45.5% of women were living with their sexual partners ($p = 0.134$). A similar proportion, 54.6% of men and 54.5% of women, were not engaged in multiple sexual relationships ($p = 0.124$). Furthermore, most HIV-positive individuals, 45.4% of men and 40.9% of women, did not have sexual encounters during travel ($P$ = 0.196). About 85.2% of men and 90.9% of women were not currently on ART ($p = 0.153$). Additionally, 63.9% of men and 50% of women were not co-infected with any urinary tract infections ($p < 0.1$). Table 2.

## Factors associated with HIV infection

Table 3 shows factors significantly associated with HIV infection among fishing communities at $p < 0.05$. In multivariate analysis, partners living apart or separated were less likely to be infected with HIV than those living together (aOR 0.33, CI: 0.69 - 0.88, p = 0.029).

**Table 1**
*Baseline Characteristics of the Study Participants*

| Variables | | n (%) |
|---|---|---|
| Age (years) | Mean (SD) | 32.2 (11.3) |
| Gender | Male | 260 (73) |
| | Female | 96 (27) |
| Education | Non formal | 25 (7) |
| | Primary (Not completed) | 129 (36.2) |
| | Primary (Completed) | 121 (34) |
| | Secondary (Not Completed) | 39 (11) |
| | Secondary (Completed) | 41 (11.5) |
| Marital Status: | Previously in a union | 35 (9.8) |
| | Single | 244 (68.5) |
| | In a union | 73 (20.5) |
| Occupation | Boat crew | 165 (46.3) |
| | Fish Monger/Trader | 104 (29.2) |
| | Other commercial Traders (shopkeepers) | 62 (17.4) |
| | Other fisherfolk (Boat owners, Builders) | 20 (5.6) |
| Monthly income (Ksh) | < 5,000 | 144 (40.4) |
| | 5,000 - 10,000 | 174 (48.9) |
| | >10,000 | 31 (8.7) |
| Previously HIV testing | Yes | 351 (98.6) |
| | No | 5 (1.4) |

**Table 2**
*Characteristics by Gender and HIV Infection Rates*

| | | HIV Serostatus | | | | |
|---|---|---|---|---|---|---|
| | | Male | | Female | | |
| | | Positive (n =108) | Negative (n = 145) | Positive (n = 44) | Negative (n=52) | P-values |
| **Characteristics** | | n (%) | n (%) | n (%) | n (%) | |
| Age groups (years) | 18-29 | 43 (39.8) | 59 (40.7) | 18 (40.9) | 24 (46.2) | |
| | 29-47 | 49 (45.4) | 69 (47.6) | 21 (47.7) | 21 (40.4) | 0.962 |
| | >47 | 13 (12) | 13 (9.0) | 5 (11.4) | 6 (11.5) | |
| Marital status | Previously in a union | 9 (8.3) | 8 (5.5%) | 7 (15.9) | 10 (19.2) | |
| | Single | 75 (69.4) | 99 (68.3) | 31 (70.5) | 35 (67.3) | *<0.1** |
| | In a union | 24 (22.2) | 35 (24.1) | 5 (11.4) | 7 (13.5) | |
| Condom use with 1st and 2nd partner | Yes | 35 (32.4) | 43 (29.7) | 9 (20.5) | 14 (26.9) | |
| | No | 52 (48.1) | 85 (58.6) | 24 (54.5) | 30 (57.7) | 0.134 |
| | Sometimes | 6 (5.6) | 1 (0.7) | 3 (6.8) | 1 (1.9) | |
| Age differences with 1st partner | >10 years | 5 (4.6) | 7 (4.8) | 7 (15.9) | 10 (19.2) | |
| | <10 years | 19 (17.6) | 25 (17.2) | 6 (13.6) | 2 (3.8) | *<0.1** |
| | Same age | 78 (72.2) | 106 (73.1) | 30 (68.2) | 39 (75) | |
| Living with a sexual partner | Yes | 55 (50.9) | 83 (57.2) | 20 (45.5) | 33 (63.5) | *<0.1** |
| | No | 17 (15.7) | 14 (9.7) | 6 (13.6) | 2 (3.8) | |
| Took alcohol before sexual acts | Always | 21 (19.4) | 20 (13.8) | 0 | 0 | *<0.1** |
| | Sometimes | 8 (7.4) | 16 (11) | 0 | 1 (1.9) | |
| | Never | 14 (13) | 20 (13.8) | 4 (9.1) | 8 (15.4) | |
| Circumcised | Yes | 57 (52.8) | 70 (48.3) | 0 | 0 | *<0.1** |
| | No | 41 (38) | 60 (41.4) | 5 (11.4) | 12 (23.1) | |
| In a multi-sexual relationship | Yes | 27 (25.) | 26 (17.9) | 11 (25) | 4 (7.7) | |
| | No | 59 (54.6) | 76 (52.4) | 24 (54.5) | 38 (73.1) | 0.124 |
| | Don't know | 4 (3.7) | 11 (7.6) | 3 (6.8) | 3 (5.8) | |
| Condom availability | Always | 41 (38) | 52 (35.9) | 5 (11.4) | 18 (34.6) | *<0.1** |
| | Sometimes | 28 (25.9) | 35 (24.1) | 14 (31.8) | 8 (15.4) | |
| | Never | 2 (1.9) | 8 (5.5) | 3 (6.8) | 2 (3.8) | |
| Ever inherited any widows | Yes | 6 (5.6) | 15 (10.3) | 5 (11.4) | 4 (7.7) | 0.479 |
| | No | 88 (81.5) | 106 (73.1) | 34 (77.3) | 39 (75) | |
| Ever paid for sex | Yes | 10 (9.3) | 22 (15.2) | 1 (2.3) | 0 | |
| | No | 49 (45.4) | 67 (46.2) | 14 (31.8) | 18 (34.6) | *<0.1** |
| Had sex during travels | Yes | 7 (6.5) | 13 (9) | 10 (22.7) | 7 (13.5) | 0.196 |
| | No | 22 (20.4) | 16 (11) | 18 (40.9) | 36 (69.2) | |
| Condom use during travels | Yes | 7 (6.5) | 13 (9) | 7 (15.9) | 4 (7.7) | 0.228 |
| | No | 22 (20.4) | 16 (11) | 6 (13.6) | 6 (11.5) | |
| Urinary tract infections | Yes | 37 (34.3) | 41 (28.3) | 20 (45.5) | 21 (40.4) | <0.1* |
| | No | 69 (63.9) | 102 (70.3) | 22 (50) | 30 (57.7) | |
| ART uptake | Yes | 16 (14.8) | 9 (6.2) | 4 (9.1) | 6 (11.5) | 0.153 |
| | No | 92 (85.2) | 136 (93.8) | 40 (90.9) | 46 (88.5) | |
| Treatment for ulceration | Yes | 30 (27.8) | 33 (22.8) | 18 (40.9) | 12 (23.1) | 0.643 |
| | No | 21 (19.4) | 34 (23.4) | 12 (27.3) | 12 (23.1) | |
| Cotrimoxazole use | Yes | 11 (10.2) | 6 (4.1) | 2 (4.5) | 5 (9.6) | 0.21 |
| | No | 97 (89.8) | 139 (95.9) | 42 (95.5) | 47 (90.4) | |
| Sources for condoms | GOK facility | 49 (45.4) | 49 (33.8) | 17 (38.6) | 19 (36.5) | |
| | Non-GOK facility | 9 (8.3) | 23 (15.9) | 3 (6.8) | 11 (21.2) | <0.1* |
| | GOK and Non-GOK facility | 11 (10.2) | 13 (9) | 2 (4.5) | 0 | |
| | Other sources | 39 (36.1) | 60 (41.4) | 22 (50) | 22 (42.3) | |

** - P value for chi-square significance at <0.1*

Participants who were receiving ART were less likely to be infected with HIV compared to those not taking ART (aOR *0.36*, CI: *0.13 - 0.96*, *p* = 0.019). Among male participants, those who did not use condoms during sex with their first and second partners were more likely to test positive for HIV than those who used condoms consistently (aOR 3.25, CI 1.14 - 9.95, p = 0.07). Furthermore, men who obtained condoms from non-GOK facilities were more likely to test positive for HIV than those sourcing condoms from government facilities (aOR 5.67, CI 1.17-34.4, p = 0.09). Conversely, among men, those taking ART were less likely to test positive for HIV than those on ART (aOR 0.20, CI 0.04-0.86, *p* = 0.04). For female participants, none of the analysed factors were significantly linked to changes in infection odds ratios.

## Discussion

The current trends in HIV research indicates a particular focus on sub-populations with notably high HIV prevalence such as fishing communities (fisherfolk), truck drivers, men who have sex with men (MSM), transgender individuals, and sex workers. These groups serve as reservoirs that sustain infections at the population level and often drive transmission dynamics across the general population [23-25]. This has continued to be a major barrier to achieving the UNAIDS HIV control targets of 90-90-90 for HIV testing, treatment and viral suppression. Identifying high-prevalence HIV hotspots and implementing tailored, population-specific prevention and control strategies could help move the country toward a disease-free equilibrium [26 - 29]. Among the 349 fisherfolk enrolled, 152 (43.6%) were HIV seropositive, with 108/152 (71.1%) being men and 44/152 (28.9%) women. This prevalence is significantly high, highlighting the important role this population plays in the transmission dynamics of HIV in the Nyanza region of Kenya.

**Table 3**

*Adjusted Factors Associated with HIV Prevalence among Fishing Communities in Bondo District*

| Variables | Multivariate All (n = 356) | | Multivariate Male (n = 260) | | Multivariate Women (n = 96) | |
|---|---|---|---|---|---|---|
| | *P* - value | aOR (95%CI) | *P- value* | aOR (95%CI) | *P - value* | aOR (95%CI) |
| Living with a sexual partner | | | | | | |
| Yes | | Ref | | Ref | | Ref |
| No | **0.029* | *0.33 (0.12 - 0.8)* | 0.13 | 0.39 (0.12 - 1.3) | 0.12 | 0.12 (0.004 - 1.3) |
| In a multi-sexual relationship | | | | | | |
| Yes | 0.55 | 0.77 (0.33 - 1.8) | 0.96 | 1.02 (0.38 - 2.88) | 0.97 | 0.96 (0.08-13.2) |
| No | | Ref | | Ref | | Ref |
| Condom use with 1st & 2nd partners | | | | | | |
| Yes | | Ref | | Ref | | Ref |
| No | 0.72 | 1.19 (0.45 - 3.09) | *0.07* | *3.25 (1.14 - 9.95)* | 0.21 | 0.18 (0.007- 1.95) |
| ART uptake | | | | | | |
| Yes | *0.019* | *0.36 (0.13 - 0.96)* | **0.04* | *0.20 (0.04 - 0.86)* | 0.58 | 2.45 (0.12- 102.7) |
| No | | Ref | | Ref | | Ref |
| Had sex during travels | | | | | | |
| Yes | 0.15 | 0.52 (0.21 - 1.26) | 0.42 | 0.63 (0.20 - 1.99) | 0.26 | 0.38 (0.006-2.04) |
| No | | Ref | | Ref | | Ref |
| Sources for condoms | | | | | | |
| GOK facilities | | Ref | | Ref | | Ref |
| Non-GOK facilities | 0.29 | 2.19 (0.55 - 10.4) | *0.09* | *5.67 (1.17 - 34.4)* | 0.60 | 2.30 (0.12 - 82.8) |
| GOK and Non-GOK facilities | 0.18 | 0.36 (0.06 - 1.59) | 0.80 | 0.79 (0.13 - 0.14) | - | - |
| Other sources | 0.34 | 1.53 (0.64 - 3.67) | 0.24 | 1.87 (0.67 - 5.32) | 0.61 | 1.76 (0.19 - 18.4) |

[1]aOR = Adjusted Odds Ratio, CI = Confidence Interval, p value = significance at *0.05, Ref = Referent

Their high mobility from one beach to another and their casual sexual relationships known as 'fish for sex' along several beaches [3, 4] could partly explain the high HIV prevalence in this population. The latest (2024) HIV prevalence of 43.6% among fisherfolk was seven times higher than the 9.5% prevalence in the general population of Bond district, Siaya County, in the same year [7]. Women had a higher prevalence of HIV than men, indicating they were disproportionately affected.

In 2019, Kwena *et al* [3] reported a prevalence of 32.0%, with women experiencing a higher disease burden of 38% compared to 29% in men [3]. Similarly, in Uganda, HIV prevalence was recorded at 44%, while in Tanzanian fisherfolk living on Lake Victoria islands, it ranged from 7.2% to 23% [30, 31].

When considering socio-demographic and behavioural risk factors for HIV acquisition and transmission, antiretroviral (ART) enrollment remains low for this population, aligning with poor or absent cotrimoxazole administration, which contributes to a high prevalence of STI-like symptoms such as ulceration and unusual urinary tract discharge. These findings align with earlier studies [32, 33], which indicated that high mobility and HIV fatalism reduce ART uptake, while discontinuing cotrimoxazole increases susceptibility to HIV-related co-morbidities. Additionally, independent ri32sk factors like low condom usage and sourcing condoms from non-governmental facilities are associated with higher HIV prevalence, supported by previous studies showing that low condom use elevates HIV risk [13, 34]. This is mainly due to ignorance and a lack of HIV prevention knowledge [35]. According to Kyei-Gyamfi *et al* [36], the high mobility of fisherfolk pursuing their livelihoods makes it difficult for most to access HIV education opportunities, contributing to poor awareness of HIV transmission and prevention [33]. Consistent with earlier studies, ART use is associated with a reduced risk of HIV infection, as observed among pregnant women on ART [34, 37].

## Study Limitations

Our study had several limitations that may influence how the results are interpreted. First, it was a cross-sectional study; we could not precisely measure causality. Second, the study recruited more men than women, which limits the findings' applicability and generalizability. Additionally, responses to questions asked during face-to-face interviews about sensitive issues might be affected by social desirability bias, leading to under- or overreporting, especially regarding sexual behaviours.

## Conclusion

The HIV prevalence of 43.6% among these fishing communities (disproportionately affecting more males than females) shows that they remain a high-risk group for HIV transmission and acquisition along Lake Victoria's beaches and beyond. Key factors driving HIV infection within this population include ART uptake, multiple sexual partnerships, and inconsistent condom use. These findings highlight the ongoing need to implement measures aimed at preventing the spread of HIV among populations along the shores of Lake Victoria.

## Recommendations

Targeted interventions that address the mobility, occupational context, and social dynamics of these populations are urgently needed to reduce ongoing transmission.

Strengthening HIV testing, linkage to care, and sustained ART uptake is essential to lower community viral load and prevent onward transmission. Community-based and mobile service delivery models should be expanded to improve access, especially for men. In addition, intensified promotion of consistent condom use and risk-reduction messaging aimed at reducing multiple sexual partnerships should be

implemented through tailored, behavior-focused interventions.

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